e-ISSN : 2620 3502
p-ISSN : 2615 3785

REDUCTION OF DESTRUCTIVE PROCESSES IN CONCRETE CONCRETE PROCESSING IN DRY-HOT CLIMATE CONDITIONS

Khakimov Sh.A[1], Mamadov B[2], Muminov K[3], Maqsud's son Bakhtiyor[4], Cholponov O[5], Nazarov R[6], Egamberdiev A[7]
[1,3,4,5,6,7]Namangan Engineering and Construction Institute

ABSTRACT

We know that one of the main processes in concrete work in dry hot-climatic conditions is the reduction of physical destructive processes at different stages in the initial phases of concrete hardening. One of these problems is the formation of plastic deposition in the newly laid concrete, which results in the formation of cracks (cracks) in the concrete. Under the influence of solar radiation and high temperatures, the amount of water in the newly laid concrete mix begins to evaporate rapidly [1,4]. Intensive evaporation of water from the bottom to the top of the concrete mix results in the formation of interconnected pores, resulting in a defective structure of the concrete, which leads to a decrease in the strength of the concrete.

Keywords: dehydration of the concrete mix, small cracks, Intensive evaporation.

1. INTRODUCTION

As a result of dehydration of the concrete mix, the cement hydration process slows down and may even stop. If the hardening of the concrete is not adequately controlled, its strength can only reach 50% of the strength of the project. According to the results of research (A. Lykov's theory), uneven distribution of water in concrete and its evaporation from the capillary-porous body under the influence of high temperatures lead to undesired large subsidence deformations. Therefore, cracks and other defects can occur in concrete [1, 3,4]. Rapid dehydration of hardened concrete in low humidity environments adversely affects the hydration mechanism of the cement stone, resulting in large plastic, general subsidence, and crack formation in structures.

To reduce or eliminate these negative effects, it is recommended to take care of the newly laid concrete. The hardening of hardened concrete can be carried out in several main ways: The method of covering (covering) the concrete surface with polymer films [2,3,4]. Bunda:

- welding and rounding of individual pieces of polymer films and covering the surface with a solid film;
-burden the edges of the films with wood, sand or soil;
- Cover the flat surface of the concrete with a film that does not accumulate evenly and holds tightly;
-protection of the film from mechanical damage;
-It is recommended to remove the film in the evening after the maintenance of concrete.

The construction laboratory determines the retention time of the newly laid concrete under polymer films, taking into account the specific climatic conditions. Covering the concrete surface with inventory thermal insulation coatings (ITVP). These coatings are made by pulling a two-layer polyethylene film on wooden or metal frames. They can also be spread and removed. The effectiveness of this method is not very high, it is sermexnat.

According to the research of Malinsky EN, Krylov B.A., plastic deposition in concrete in dry hot climates is one of the main factors influencing the physical destructive processes and the deterioration of physical and mechanical properties [2,4]. The process of plastic deposition of freshly laid concrete continues until the water in the concrete reaches a critical evaporation level and gradually begins to stabilize over time. Foreign scientists (V. Lerch, D. Tinza, S. Friedman, etc.) also say that concrete hardens in dry and hot climates. emphasizes the appearance of cracks on the surface in the early hours and a sharp decline in the quality of concrete. The process of plastic sinking is also given serious attention in the American standards "Concrete work in hot climates" [3,4,10]. subsidence causes a radical change in its physico-mechanical structure in dry and hot climates. In the initial hardening of concrete, plastic subsidence occurs when the new

e-ISSN : 2620 3502
p-ISSN : 2615 3785

concrete is in a soft state that has not yet hardened.

The resulting concrete surface will cause small cracks and other small defects.

Experiments have shown that in hardened concrete in dry and hot climates, mainly in the initial times, plastic subsidence occurs significantly after 2.5-3.0 hours, and in subsequent periods it continues to be insignificant even in concrete stored under normal conditions.

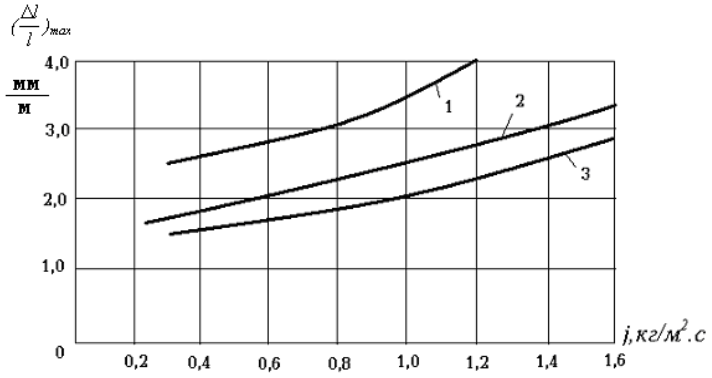


Figure 1. The water used to harden the concrete formed from continuous evaporation, depending on the amount the size of the plastic sink

Under such conditions, the water absorption index of hardened concrete is 8-10 times, and frost resistance is significantly reduced. Experimental results have shown that the hardened concrete surface in dry and hot conditions should be treated with certain coatings or special coatings that create a hermetic density on the surface. In this case, the gap layer between the concrete surface and the coating is important. That is, the larger the gap between them, the greater the dehydration in the top layer of concrete. As a result, the concrete "plastic subsidence"

$$(\frac{\Delta l}{l})_{max} = f_{(i)}$$

the larger it is [2,3,4,5,8].

Conducting research under natural conditions is mainly focused on the fulfillment of equation ($\frac{\Delta l}{l}$) maxq f (j). Some experiments obtained separately were performed at different times of the year, sometimes for 6–7 months (Fig. 1).

Depending on the purpose of the experiment, the types and descriptions of the materials used were changed. Wind effects were not taken into account.

As an experiment in the production of concrete and reinforced concrete products at the "Experimental Test Structures Plant" in the town of Aktash, using the normative guidelines "Determination of the effectiveness of curtain-forming compositions" developed by the Moscow-based Research Institute of Concrete and Reinforced Concrete. we studied the effect of curtain-forming compositions on the plastic sinking process of newly laid concrete. This experiment takes into account the plastic WSCtling process in the initial period of concrete hardening when using different curtain-forming compositions for the care of newly laid concrete. In this case, the assessment of the effect of various curtain-forming compositions (PCTs) used in the initial period of the concrete mix for its maintenance on the process of plastic deposition, the coefficient of concrete care is determined by the following formula:

$$Кэф = 1 - \frac{Ei - Eo}{Emax - Eo}$$

In this case: Eo - initial deformations in the newly laid concrete (water evaporation is not allowed), mm/m;

e-ISSN : 2620 3502
p-ISSN : 2615 3785

Emax - maximum amount of concrete plastic sinking without care, mm/m;

The amount of plastic subsidence of concrete protected by Ei- PXT, mm/m. The formula shows that Кэф =1 when using the most effective PXT, Кэф = 0 when using inefficient PXT.

According to plant-based studies, Кэф = 0.89 when using a water-soluble content (WSC) and Кэф = 0.81 when using an aqueous dispersion content (ADC) for the care of freshly laid concrete. Figure 2 shows the results of the study.

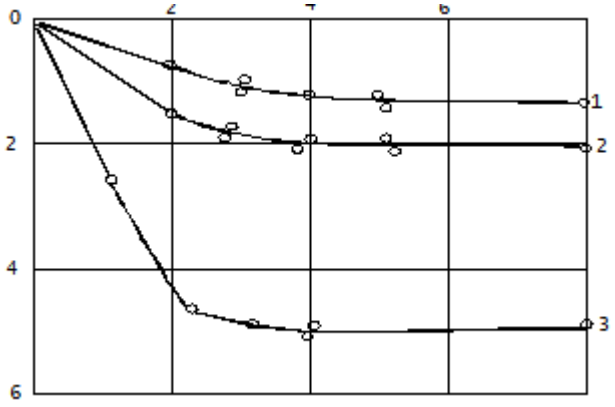


Figure 2. Plastic deposition of concrete depends on the method of care.

1. When using WSC (water soluble content)

2. When ADC (aqueous dispersion content) is used

3.Sample in careless condition.

Note: The composition of the concrete mix is 1: 2.91: 4.08, S/Ts = 0.54; The main parameters of a special climatic chamber are: t = 43 ± 3^0C; α = 35%. The graph shows that when curtain-forming compositions are used for the care of concrete, which is carried out as an experiment, the plastic deposition in the hardening process of concrete is significantly reduced. Studies have shown that hardening concrete leads to a decrease in its strength as the ambient temperature rises (if the air humidity does not change) [3,7,8,9]. Experiments have shown that the strength of hardened concrete in summer conditions (unattended in dry hot climates) can be reduced by up to 50% compared to the strength of hardened concrete under normal conditions [4,5,7,8] ¬.

The amount of water evaporation also has a large negative effect on the strength of concrete. Studies show that if concrete hardens under the influence of high ambient temperatures, dense layers (hydration process) are formed around the hydrated cement particles. Therefore, it prevents water from entering fully unhydrated cement particles. As a result, the hydration process of the cement may slow down or stop altogether. As a result, the potential strength of concrete is significantly reduced.

As a result, it has been shown that the strength of dehydrated concrete (when dewatering occurs before or after the concrete mix is laid) can be reduced to 20-35% or even 50%. The decrease in the strength of concrete is explained by the formation of pores in the concrete as a result of rapid evaporation of water during the extinction of the hardening process. The filtration capacity of freshly laid concrete in dry-hot climates (t = 430S, α = 35%) is 70 times higher than that of hardened concrete under "normal" conditions. This indicator has a significant negative impact on the strength of concrete and its performance. During the hardening of concrete, any measures taken against dehydration will lead to a significant increase in its strength.

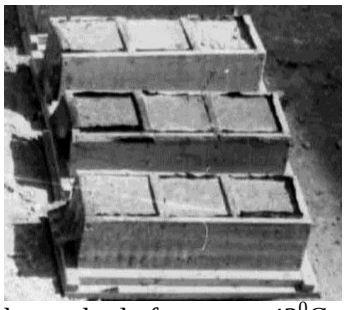
Samples of 100x100x100 mm were prepared to determine the compressive strength of the concrete. The prepared samples were sprayed with film-forming compositions and consumption of 350-400 gm2.

The solidification medium of the samples was t = 43^0C, α = 35% Hardening samples were taken under moist sand for reference.

e-ISSN : 2620 3502
p-ISSN : 2615 3785

Samples were tested after 1, 3, and 28 days. Concrete design brand-300. The results of the study are presented in Table 1.





Compressive strength of concrete depending on the method of care t = 43^{0}C, α = 35%, concrete design grade-300

Table 1

№	Concrete care	Rск, MPa, term		
		1	3	28
1	water soluble content	12,3	20,1	31
2	aqueous dispersion content	13,5	20,3	30,5
3	A layer of moist sand	13,4	20,1	26,4
4	Careless	12,3	1,1	23,7

As can be seen from Table 1, when using curtain-forming compositions, the strength of the concrete is higher than the strength of the project, while the strength of the concrete solidified under the moistened sand is lower than the strength of the project.

In addition, sprinkle curtain-forming ingredients on the surface of freshly laid concrete. To protect freshly lost concrete from dehydration, it hardens quickly and creates good moisture conditions, its surface is sprayed with curtain-forming ingredients. These compounds form a moisture-proof film (film) on the concrete surface in a short time. Its advantage over other methods is that these compositions can be sprayed within 10-15 minutes after laying on the concrete surface. It is especially advisable to cover large surfaces (ratio of surface area to its volume) with such materials when concreting large structures (roads and airfield pavements, canal tiles, etc.), as well as when performing concrete work in places where there is a shortage of water. A concrete mix was prepared and several studies were conducted to determine the frost resistance of freshly poured concrete when curtain-forming compositions were applied. Experiments were carried out mainly at the Experimental Test Structures Plant in Aktash as an experiment in the production of concrete and reinforced concrete products as a test of frost resistance of freshly laid concrete. Plant-based studies have shown that Кэф =0.89 when we use a water-soluble content for freshly laid concrete care and Кэф =0.81 when we use an aqueous dispersion content .

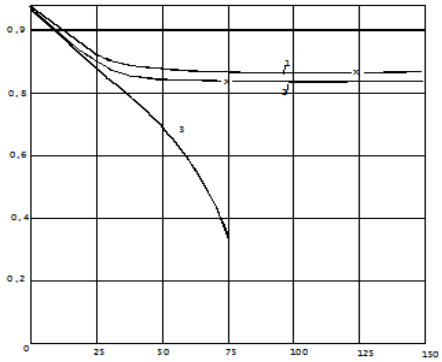


Figure 3. Frost resistance of concrete hardened under curtain-forming compositions.

1. When is used water soluble content

e-ISSN : 2620 3502
p-ISSN : 2615 3785

2. When is used aqueous dispersion content

3 Sample in careless condition.

Note: concrete mix composition 1:2,91:4,08, C/Ц = 0,54; The main parameters of a special climatic chamber are: $t = 43 \pm 3^0C$; $\alpha = 35\%$.

The following basic requirements are WSC for materials that form a coating on the surface of newly laid concrete:

a) they should be well sprayed on the concrete surface, form a waterproof integral coating on the surface, which should protect the concrete from dehydration and adhere to its surface;

b) do not corrode concrete and reinforcement; c) not toxic; g) must be the same during storage and transportation.

The application of curtain-forming compositions for the care of freshly laid concrete is of great efficiency, because the technology of application of this method is simple, relatively inexpensive compared to other methods, the raw material is sufficient. Under the curtain-forming coatings, favorable humidity conditions are created for the concrete to harden. In order to determine the frost resistance of concrete in terms of strength, based on the results of the study, a concrete mix was prepared with the following composition. In this case, the cement for 1 m3 of concrete mix composition (1:2,20:4,07, C/Ц = 0,55) (quasoy cement brand M400) - 334 kg / m3; Water - 186 l / m3; sand - 734 kg / m3; gravel (fraction-5-20mm) -1356 kg / m3.

Curtain-forming ingredients were sprinkled on freshly prepared 100x100x100 mm specimens. The content consumption was 350-400 g□m2. Unsprinted samples (without care) were taken for control. After spraying on the samples, some of the samples were placed in natural conditions and some in a special climatic chamber ($t = 43^0C$, $\alpha = 35\%$)[2]. After R_{28} days, the samples were separated from the mold and tested in accordance with UzRST 10000.0-95 "Basic method for determining the cold resistance of concrete." The results of the studies are presented in Figure 3 and Table 2.

Table 2

Indicators of cold resistance of concrete

№	Method of care	Compressive strength of concrete				Frost resistance, cycle
		Before the test, 100 cycles	After the test, 100 cycles	Before the test, 150 cycles	After the test, 150 cycles	
1	water soluble content	304	265	310	278	150
2	aqueous dispersion content	298	258	309	276	150
3	Careless concrete	284	214	-	-	75

`As can be seen from Figure 3 and Table 2, when the curtain-forming compounds are used for concrete care, its frost resistance is 150 cycles. The frost resistance of the untreated concrete sample is 75 cycles.The study shows that WSC when water-soluble content) and ADC (aqueous dispersion content) are used, its frost resistance is 150 cycles and therefore these compositions can provide the strength and frost resistance of hardening concrete in dry hot climates [4,8,9].

When using curtain-forming compositions for the care of newly laid concrete, its efficiency is Кф = 0.90 and 0.80%. It also has high cold tolerance and waterproofing ability.

It can be seen that the strength of the untreated concrete specimens was 78% of the design strength. Although the strength of the untreated hardened concrete specimen is high (78%), its structure indicates that such concretes are prone to deterioration during operation and therefore do not last long.

In addition, in dry-hot climates, the interconnection of cement stone and aggregates in the concrete hardened under the curtain layer occurs well. Cement hydration, on the other hand, was 1.5-2 times higher (compared to untreated concrete).

e-ISSN : 2620 3502
p-ISSN : 2615 3785

References

1. Krylov B.A., Khakimov Sh.A. Heliothermal treatment of wood concrete based on cotton stalks in a dry hot climate., Architecture and Construction of Uzbekistan 1988. №9-journal.
2. 2.Khakimov Sh.A. Deformation properties of wood concrete, hardening in the solar chamber. - Improving the quality and efficiency of the use of concrete and reinforced concrete products and structures-M. NIIZhB 1988 collection of reports.
3. Krylov BA, Khakimov Sh.A., Lightweight concrete for rural construction in areas with dry and hot climates., - Republican scientific and technical conference scientific and technical progress in the "technology of building materials" Gosstroy Kazakhstan. Alma-Ata, 1990
4. Malinsky E.N .. Study of plastic shrinkage of concrete in a dry hot climate. - Construction and architecture of Uzbekistan, 1975, No. 5.
5. Khakimov Sh.A. and others Republican scientific and technical conference "Indicators of growth of concrete hardening at different temperatures", FerPI, May 23-24, 2003, pp. 163-165.
6. Khakimov Sh.A and others :. Two-stage heat treatment of concrete in areas with hot climates. – FarPI scientific-technical magazines., 2014., No. 3.
7. 7.Krylov B.A., Khakimov Sh.A. Experience in the use of agricultural and industrial waste in the production of wood concrete in areas of dry hot climate. - Republican scientific and technical conference scientific and technical progress in "technology of building materials" Gosstroy Kazakhstan. Alma-Ata, 1990
8. Krylov BA, Khakimov Sh.A., The use of solar energy for heat treatment of wood concrete products. - Materials of the international scientific and technical conference on the problem of solar technology and longevity of Concrete in dry hot climate conditions, V-conference meeting on the problem., Technology of Concrete works. Bukhara-1992 12-14 October.
9. Khakimov Sh.A. and others :. The effect of curtain-forming compositions on the plastic deposition of concrete. - Republican scientific-practical conference "Independent education in the training of competitive personnel: the experience of the world education system and cooperation of higher education institutions." Mater. N., NamMPI, 2010y.
10. Lerch W. "Plastic ahrinkage" ACI, vol 28, n. 8, 1978, pp. 797-802.